

# **Engineering Design File**

PROJECT FILE NO. 020996

## **Staging, Storage, Sizing and Treatment Facility**

## **Flow and Pressure Calculations of the Raw Water and Potable Water Systems**

Prepared for:  
U.S. Department of Energy  
Idaho Operations Office  
Idaho Falls, Idaho



# ENGINEERING DESIGN FILE

PROJECT FILE NO. 020996  
EDF SERIAL NO. EDF-2655  
FUNCTIONAL FILE NO. \_\_\_\_\_

PROJECT/TASK SSSTF UTILITIES INSTALLATION - PIPING

SUBTASK Piping Systems

EDF PAGE NO. 1 OF 5

TITLE **Flow and Pressure Calculations**

## SUMMARY

This EDF contains the flow and pressure calculations for piping systems to the SSSTF and ICDF located at INTEC. The EDF reveals the following:

## RAW WATER

Raw water is available at 550 gpm and 60 psig at the SSSTF/ICDF boundary. The system can deliver 850 gpm at 6 psig at the SSSTF/ICDF boundary

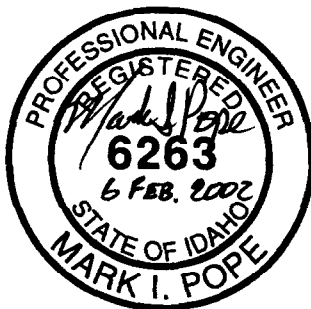
## POTABLE WATER

Adequate potable water is available to all SSSTF facilities at approximately 70 psig.

QUALITY LEVEL ☐ 1 ☐ 2 ☐ 3 ☒ 4

KEYWORDS (e.g. area, structure no., general subject matter, etc.):

AUTHOR



DISTRIBUTION (COMPLETE PACKAGE):

Project File

DISTRIBUTION (COVER SHEET ONLY):

CHECKED *C. O. Kingsford* DATE *3-01-02*  
C. O. Kingsford, P.E.

APPROVED/ACCEPTED *C. J. Hurst* DATE *3/6/02*  
C. J. Hurst, P.E. *S. L. Austad* DATE *3/1/02*  
S. L. Austad, P.E.

INDEPENDENT PEER REVIEWER *M. H. Doornbos* DATE *3/8/02*  
M. H. Doornbos, P.E. (CORB Chair)

BBWI REQUESTOR *R. L. Davison* DATE *3/9/02*  
R. L. Davison

## 1. General

This EDF contains calculations for raw water and potable water flow and pressure losses for the SSSTF Utilities and the SSSTF Minimum Infrastructure design packages. The SSSTF designs also support the ICDF.

## 2. Raw Water

Water at INTEC is pumped from two deep wells into storage tanks for delivery to the various water systems throughout the plant. Raw water is taken from the storage tanks and distributed by three raw water supply pumps. The main raw water pumps deliver 2,000 gpm and 2,500 gpm at 100 psi, and an emergency backup pump delivers 1,500 gpm. The two main pumps are operated interchangeably based on system supply pressure. Normal raw water demand for the plant is less than 1,500 gpm, and the two larger pumps rarely operate.

Raw water is delivered to the various facilities at INTEC through the raw water distribution system as follows:

### North Distribution Header

- Fire Water Storage Tanks
- Office Buildings Water Source Heat Pumps

### South Distribution Header

- Tank Farm
- Various Small Services to CPP-751 and CPP-753
- Coal Fired Steam Generating Facility (CFSGF)
- CPP-626 and CPP-603

The SSSTF tie-in to the raw water system is into the 6" main header downstream of the CFSGF tee, and upstream of CPP-626 and CPP-603. Because flow measurements have not been taken at this tie-in point, a simplified flow/pressure loss calculation is presented herein to estimate flow and pressure losses for the system up to the SSSTF boundary with the ICDF.

For the flow/pressure calculations, the following assumptions are made:

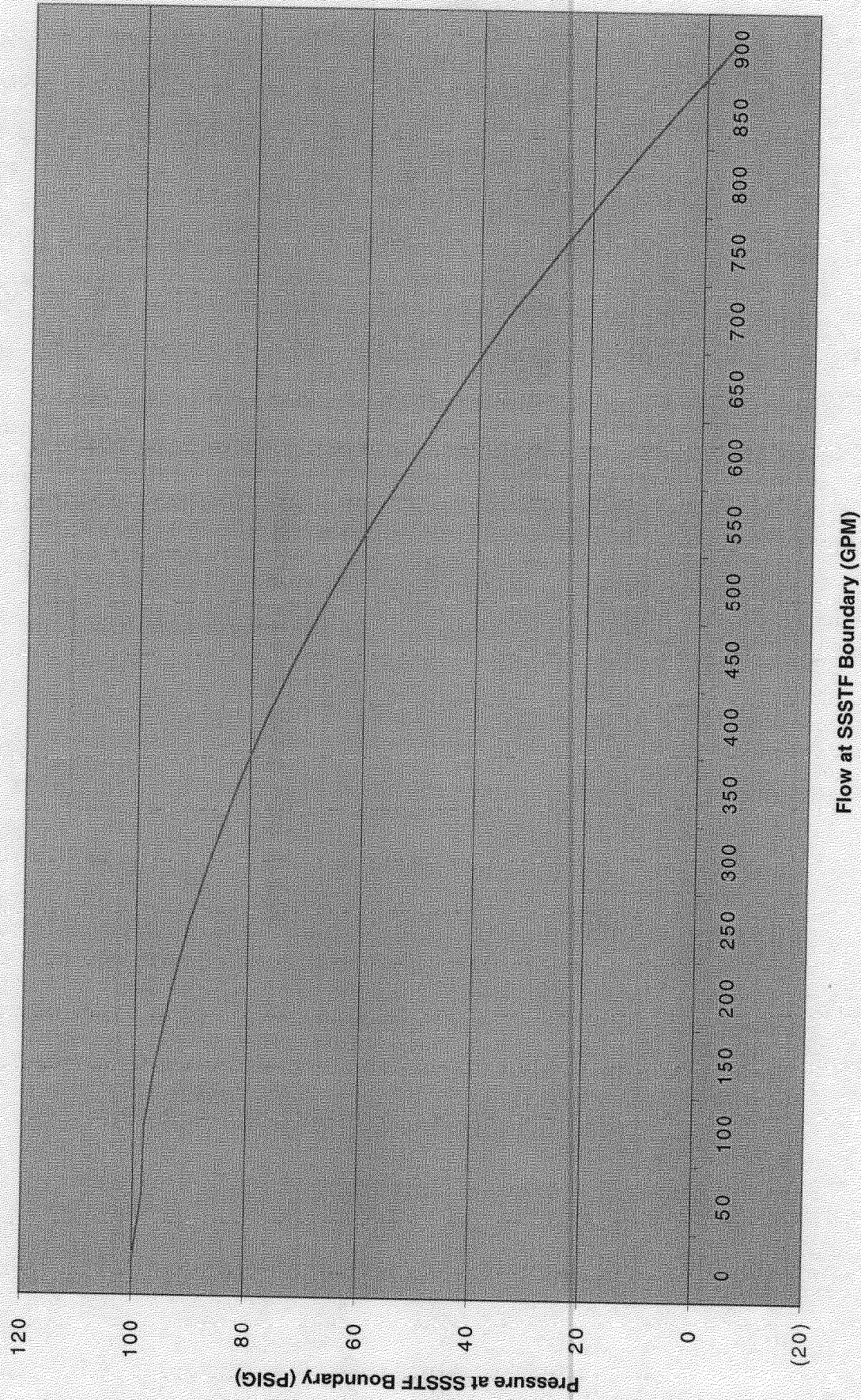
1. Raw water supply to the ICDF is not required during the times that the fire water storage tanks are being filled with the raw water system.
2. Flow through the North distribution header to the office buildings water source heat pumps has negligible effect on flow and pressure in the South distribution header.
3. Although the tank farm is connected to the South distribution header, flow requirements are minimal and sporadic, and are not included in the calculations.
4. Raw water supply to CPP-751 and CPP-753 are also minimal and sporadic, and are not included in the calculations.

5. The CFSGF is being shut down, and raw water to this facility will not be required in any significant quantity.
6. CPP-626 and CPP-603 will not require significant amounts of raw water because the water fuel storage system is being inactivated.

Simplified flow calculations for the South distribution header follow, with pressures being calculated for various flow conditions. Pressures given are for the SSSTF boundary at the ICDF. However, because ICDF piping configuration and flow needs are not known at this time, no pressure losses in the ICDF are accounted for.

Input: Flow for ICDF at SSSTF Boundary (gpm)	Input: 10" Equivalent Length (ft)	Input: 10" Pressure Loss (psi/100 ft)	Input: 8" Equivalent Length (ft)	Input: 8" Pressure Loss (psi/100 ft)	Input: 6" Equivalent Length (ft)	Input: 6" Pressure Loss (psi/100 ft)	Input: New 6" Equivalent Length (ft)	Input: New 6" Pressure Loss (psi/100 ft)	Calculate: System Pressure Loss (psi)	Calculate: Pressure at SSSTF South Boundary (psig)
0	715	0.000	656	0.000	2490	0.000	2095	0.000	0	100
50	715	0.006	656	0.108	2490	0.018	2095	0.018	2	98
100	715	0.012	656	0.022	2490	0.036	2095	0.036	2	98
150	715	0.018	656	0.032	2490	0.077	2095	0.077	4	96
200	715	0.024	656	0.043	2490	0.130	2095	0.130	6	94
250	715	0.030	656	0.051	2490	0.195	2095	0.195	9	91
300	715	0.036	656	0.072	2490	0.275	2095	0.275	13	87
350	715	0.042	656	0.095	2490	0.367	2095	0.367	18	82
400	715	0.048	656	0.121	2490	0.471	2095	0.471	23	77
450	715	0.054	656	0.151	2490	0.590	2095	0.590	28	72
500	715	0.059	656	0.182	2490	0.720	2095	0.720	35	65
550	715	0.071	656	0.219	2490	0.861	2095	0.861	41	59
600	715	0.083	656	0.258	2490	1.020	2095	1.020	49	51
650	715	0.097	656	0.301	2490	1.180	2095	1.180	57	43
700	715	0.112	656	0.343	2490	1.350	2095	1.350	65	35
750	715	0.127	656	0.392	2490	1.550	2095	1.550	75	25
800	715	0.143	656	0.443	2490	1.750	2095	1.750	84	16
850	715	0.160	656	0.497	2490	1.960	2095	1.960	94	6
900	715	0.179	656	0.554	2490	2.180	2095	2.180	105	(5)

SSSTF Raw Water Flow vs. Pressure



### 3. Potable Water

Potable water is distributed throughout INTEC through the potable water distribution system with 3 potable water pumps. The main potable water pump is on continuously, and delivers up to 60 gpm at 80 psi, while two additional pumps deliver 120 gpm each. The pumps are sequenced on in stages based on system supply pressure. Normal potable water demand for the plant is less than 60 gpm, except for early in the morning and late in the afternoons when showers are being taken. The two larger pumps only operate when the lead pump cannot meet the plant demand.

Potable water is delivered to the various facilities at INTEC through the potable water distribution system through a series of distribution mains starting with a 6" line, then reducing to a 4" line and eventually reducing to a 3" line. The SSSTF tie-in is in the 3" line between the CFSGF branch and the CPP-603 feed. The SSSTF line is 4". Because the expected flows at the SSSTF are low (less than 10 gpm), the losses throughout the system including the INTEC distribution system are less than 0.1 psi/100 ft. This results in less than 6 psi drop from the potable water pumps to the SSSTF facilities. This estimation reveals that no formal calculations are required for the SSSTF potable water line for flow or pressure losses. Adequate potable water will be available at each facility.

